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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Electric Wave Communication Cables

We, COMMUNICATIONS PATENTS LIMITED, of Carlton House, Lower Regent Street, London, S.W.1, a British company, do hereby declare the invention, for which we pray that
5 a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention is concerned with electric wave communication cables which are suitable for use in wired broadcasting systems. In such systems it is often required to distribute electric wave signals in respect of a plurality of different sound and television programmes and
15 for this purpose it is known to form a signal-distributing network of the system with multi-pair cable, that is to say with a cable which provides a plurality of separate lines each being formed by twin conductors. The object of
20 this invention is to provide improved cable of this kind whereby a high degree of immunity from cross talk or cross view can be obtained whilst keeping the overall diameter of the cable at a minimum.

25 According to the invention there is provided an electric wave communication cable in which three pairs of twisted together insulated conductors form a centre core element, each of these three pairs having electrical characteristics which limit its effective use to the transmission of audio frequency signals, and there
30 is arranged in a compact symmetrical group about this core element six pairs of twisted together insulated conductors, each of these six pairs having electrical characteristics which render it suitable for the transmission of high frequency signals.

40 In a preferred embodiment of the invention the circumscribing cylinder of the centre core element has a diameter which corresponds to that of the circumscribing cylinder of each of the said six pairs of twisted together insulated

conductors which are arranged about this element and so that adjacent pairs of these six pairs are in contact.

In another embodiment of the invention a conductor, of a pair of conductors, is accommodated in each of the interstices of at least one of the six pairs of twisted together insulated conductors suitable for the transmission of the high frequency signals, the conductors so accommodated constituting a pair which is suitable for the transmission of audio frequency signals. Advantageously, the overall diameter of each of the conductors of this audio frequency pair, including its insulation if any, is not more than two thirds of the overall diameter of each of the insulated high frequency conductors so that all four conductors of the two pairs thus provided are contained in the circumscribing cylinder of the twisted together pair which is suitable for the transmission of the high frequency signals.

Although it would be possible to provide each of the six high frequency pairs with such an associated audio frequency pair, it is thought to be advantageous to provide only alternate ones of the high frequency pairs with such an audio frequency pair.

In order that the invention more readily can be understood it will now be described, by way of example with reference to the accompanying drawing the single Fig. of which is a cross-sectional view showing the arrangement of the conductors of an electric wave communication cable according to the invention.

In this particular embodiment of the invention the centre core element is formed by the three pairs 22, 23 and 24 of twisted together insulated conductors, each of these three pairs being twisted according to a different pitch and the three pairs arranged as a twisted together (spiralled) group. These three pairs have electrical characteristics which limit their

[Price 4s. 6d.]

effective use to the transmission of audio frequency signals and can be used to constitute audio pairs of a signal-distributing network of a wired broadcasting system. Around this centre core element there are arranged, as a compact symmetrical group, six pairs, 25—30, of twisted together insulated conductors, each pair being twisted according to a different pitch. Each of these six pairs has electrical characteristics which render it suitable for the transmission of high frequency signals (say up to 15 Mc/s) and can be used to constitute a high frequency pair of the signal-distributing network of a wired broadcasting system for the purpose of distributing high frequency signals in respect of television programmes. The circumscribing cylinder of each of these high frequency pairs has the same diameter as that of the circumscribing cylinder of the centre core element formed by the group of audio pairs 22, 23 and 24. In one example of such a cable the audio pairs comprise conductors of 0.020" diameter plain copper (6½ lbs./mile wire) each sheathed with a 0.0065" radial thickness of polythene. The conductors of the high frequency pairs are 20 s.w.g. plain copper each sheathed with a radial thickness of polythene such that the twisted pair has a characteristic impedance of approximately 110 ohms. The group of six high frequency pairs is spiralled about the centre core element and the whole symmetrical assembly is wrapped with a layer 31 of suitable insulating material, such for example as one or more strips of polyethylene terephthalate. This wrapped assembly is enclosed within a polythene sheath 32. In an alternative form of such a cable (not shown) a conductive screen is provided around the wrapped assembly. Such a screen may be formed in known manner by a helical or longitudinal tape of conductive material such, for example, as an aluminium or copper tape. This screen is located between a layer of polythene which surrounds the wrapped assembly and an outer sheath of polythene. In the case of a screened cable the outer sheath of polythene can have an average radial thickness of about 0.03" but in the case of an unscreened cable the polythene sheath preferably has an average radial thickness of about 0.06" this thicker sheath serving to minimise changes in the attenuation of the cable under varying atmospheric conditions. In an alternative example of such a cable, suitable as a branch cable, the audio pairs comprise conductors of 0.0164" diameter plain copper (4 lbs./mile) each sheathed with an 0.065" radial thickness of polythene. In this case the conductors of the high frequency pairs are 26 s.w.g. plain copper each sheathed with polythene having a radial thickness such that the twisted pair has a characteristic impedance of approximately 140 ohms. The average attenuation of a high frequency pair of such a cable in which the high frequency pairs are formed of 20 s.w.g. plain

copper is about 9 db per 1,000 feet at 10 Mc/s and the corresponding figure in respect of a high frequency pair formed from 26 s.w.g. plain copper is approximately 14 db. Wired broadcasting systems which comprise such cables form the subject matter of our co-pending Application No. 40403/62, Serial No. 1,059,343.

In a modified embodiment of the invention one at least of the six high frequency pairs has associated therewith the conductors of an audio frequency pair. Thus, as shown in the drawing, the high frequency pair 27 has an additional conductor arranged in each of its interstices and these additional conductors, 33 and 34, constitute a twisted pair suitable for the transmission of audio frequency signals. Although as indicated on the drawing the conductors 33 and 34 are provided with a sheath of insulating material, for example enamel, bare conductors can be used. However if adjacent high frequency pairs are provided with the additional audio frequency pairs, insulation of the conductors of the latter pairs would be necessary. The diameter of the conductors 33 and 34 (including their insulation if any) is preferably not greater than two thirds of the diameter of the insulated conductors forming the associated high frequency pair so that the additional pair do not extend beyond the confines of the circumscribing cylinder of the high frequency pair.

In cases where the dimensions quoted have been related to a circumscribing cylinder it is to be understood that some slight variation in these dimensions may be necessary in order to provide for manufacturing tolerances.

WHAT WE CLAIM IS:—

1. An electric wave communication cable in which three pairs of twisted together insulated conductors form a centre core element, each of these three pairs having electrical characteristics which limit its effective use to the transmission of audio frequency signals, and there is arranged in a compact symmetrical group about this core element six pairs of twisted together insulated conductors, each of these six pairs having electrical characteristics which render it suitable for the transmission of high frequency signals.

2. A cable as claimed in Claim 1, wherein the circumscribing cylinder of the centre core element has a diameter which corresponds to that of the circumscribing cylinder of each of the said six pairs of twisted together insulated conductors which are arranged about this element and adjacent pairs of these six pairs are in contact.

3. A cable as claimed in Claim 1 or 2, wherein a conductor, of a pair of conductors, is accommodated in each of the interstices of at least one of the six pairs of twisted together insulated conductors suitable for the transmission of high frequency signals.

4. A cable as claimed in Claim 3, wherein

- 5 the overall diameter of each of the conductors so accommodated, including its insulation if any, is not more than two thirds of the overall diameter of each of the insulated high frequency conductors so that all four conductors of the two pairs thus provided are contained in the circumscribing cylinder of the twisted together pair which is suitable for the transmission of the high frequency signals.
- 10 5. A cable as claimed in Claim 3 or 4, wherein alternate ones only of the high frequency pairs have a conductor accommodated in their interstices.
6. A cable as claimed in any one of the preceding claims 1—5 wherein each of the pairs of twisted together insulated conductors are twisted according to a different pitch. 15
7. Electric wave communication cables constructed and arranged substantially as herein described with reference to the accompanying drawing. 20

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

